

B R E V I O R A

Museum of Comparative Zoology



US ISSN 0006-9698

CAMBRIDGE, MASS.

7 FEBRUARY 2011

NUMBER 521

DESCRIPTION OF TWO NEW SPECIES OF *MUREX* S.S. (MOLLUSCA: GASTROPODA: MURICIDAE) FROM THE NORTHERN INDIAN OCEAN

ROLAND HOUART¹

ABSTRACT. Two new species of *Murex* s.s. are described: *Murex echinodes* from Kuwait and *Murex indicus* from western India. Both species are compared with related species from Somalia, the Red Sea, Oman, and India.

KEY WORDS: Mollusca; Gastropoda; *Murex* s.s.; Indian Ocean; new species

Many new species of *Murex* s.s. have been described since the Indo-Pacific species of *Murex* s.s. were revised by Ponder and Vokes (1988), namely, *M. (M.) hystricosus* Houart and Dharma, 2001; *Murex megapex* Neubert, 1998; *M. (M.) philippinensis* Parth, 1994; *M. (M.) salomonensis* Parth, 1994; *M. (M.) somalicus* Parth, 1990; *M. (M.) spinastreptos* Houart, 2010; and *M. (M.) spinifer* Heiman and Mienis, 2010. Another species is being described from Taiwan (Houart, 2010b, in press).

Although the two species named herein were partially illustrated by Ponder and Vokes (1988), they were misidentified and figured under other names. Since that

revision was published, the definition of structural homologies through spiral cord morphology and their ontogeny was completely revised by Merle (1999, 2001, 2005). This new definition of the morphology of the spiral cords was also applied in recently described species of *Murex* s.s. by Houart and Dharma (2001) and Houart (2010a, b).

MATERIALS AND METHODS

The material used in this study belongs mainly to the collection of the Museum of Comparative Zoology and to the private collection of the author. Other comparative type material used here is housed in the Muséum national d'Histoire naturelle, Paris, France, and in the Senckenberg Museum, Frankfurt, Germany.

¹ Research Associate, Institut royal des Sciences naturelles de Belgique, rue Vautier, 29, 1000 Bruxelles, Belgium; e-mail: roland.houart@skynet.be

TABLE 1. TERMINOLOGY USED TO DESCRIBE THE SPIRAL CORDS (AFTER MERLE 1999 AND 2001). TERMINOLOGY IN PARENTHESES: ERRATIC FEATURE.

P	primary cord
s	secondary cord
t	tertiary cord
ad	adapical (or adapertural)
ab	abapical (or abapertural)
SP	subsutural cord
IP	infrasutural primary cord (primary cord on subsutural ramp)
adis	adapical infrasutural secondary cord (on subsutural ramp)
abis	abapical infrasutural secondary cord (on subsutural ramp)
P1	shoulder cord
P2–P6	primary cords of the convex part of the teleoconch whorl
s1–s6	secondary cords of the convex part of the teleoconch whorl (example: s1 = secondary cord between P1 and P2; s2 = secondary cord between P2 and P3, etc.)
ADP	adapertural primary cord on the siphonal canal
MP	median primary cord on the siphonal canal
ABP	abapertural primary cord on the siphonal canal
EABP	extreme abapertural primary cord on the siphonal canal (Example: EABP2 = between EABP1 and EABP3)
ads	adapertural secondary cord on the siphonal canal
ms	median secondary cord on the siphonal canal
abs	abapertural secondary cord on the siphonal canal
eabs	extreme abapertural secondary cord on the siphonal canal (Example: eabs1 = secondary cord between EABP1 and EABP2)
Aperture	
ID	infrasutural denticle
D1–D6	abapical denticles

The identification of shell characters and the ontogeny of spiral cord morphology and position on the shell (Table 1; Fig. 1) are mainly based on Merle (1999, 2001, 2005) and Merle and Houart (2003).

DEPOSITORY

IRSNB: Institut royal des Sciences naturelles de Belgique, Bruxelles, Belgium.
MCZ: Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts, U.S.A.
MNHN: Muséum national d'Histoire naturelle, Paris, France.
RH: Collection of the author.
SMF: Senckenberg Museum, Frankfurt, Germany.

Murex (Murex) echinodes, new species

Figures 1, 2–5, 9, 18, 40; Table 2

Murex scolopax—Bosch and Bosch, 1982: 90, text fig.; Bosch and Bosch, 1989: 58, text fig.; Ponder and Vokès, 1988: 49 (in part), figs. 76A (only), 84A (only), 85E; Coulombel, 1994: 67, text fig.; Bosch *et al.*, 1995: 117, fig. 465 (not *Murex scolopax*).
Murex megapex—Robin, 2008: 239, fig. 7 (not *Murex megapex*).

Type Material. Kuwait, 138.6 mm (lv), holotype MNHN 23114, Bahrain; 1 paratype IRSNB IG 31624/MT.2304; 2 paratypes RH (lv).

Other Material. Kalba, United Arab Emirates, 4 dd, coll. D. Rolfe; Damman, Saudi Arabia, 2 dd, RH., Bahrain, 1 lv., RH.

Distribution. Gulf of Oman, United Arab Emirates, eastern Saudi Arabia, and Kuwait.

Description. Shell large for the genus, up to 138.6 mm in height at maturity (holotype). Height/width ratio, spines not included: 2.6–3.0. Broadly ovate, spinose, weakly tuberculate. Shoulder weakly convex.

Ivory-white or light tan with axial light brown flammules, more apparent on primary spiral cords, extending on dorsal face of spines. Columellar lip glossy white. Inside of outer apertural lip white for a short distance, light brown within.

Spire high with 1.6–1.75 protoconch whorls and up to 7 broad, strongly convex, weakly nodose teleoconch whorls. Suture

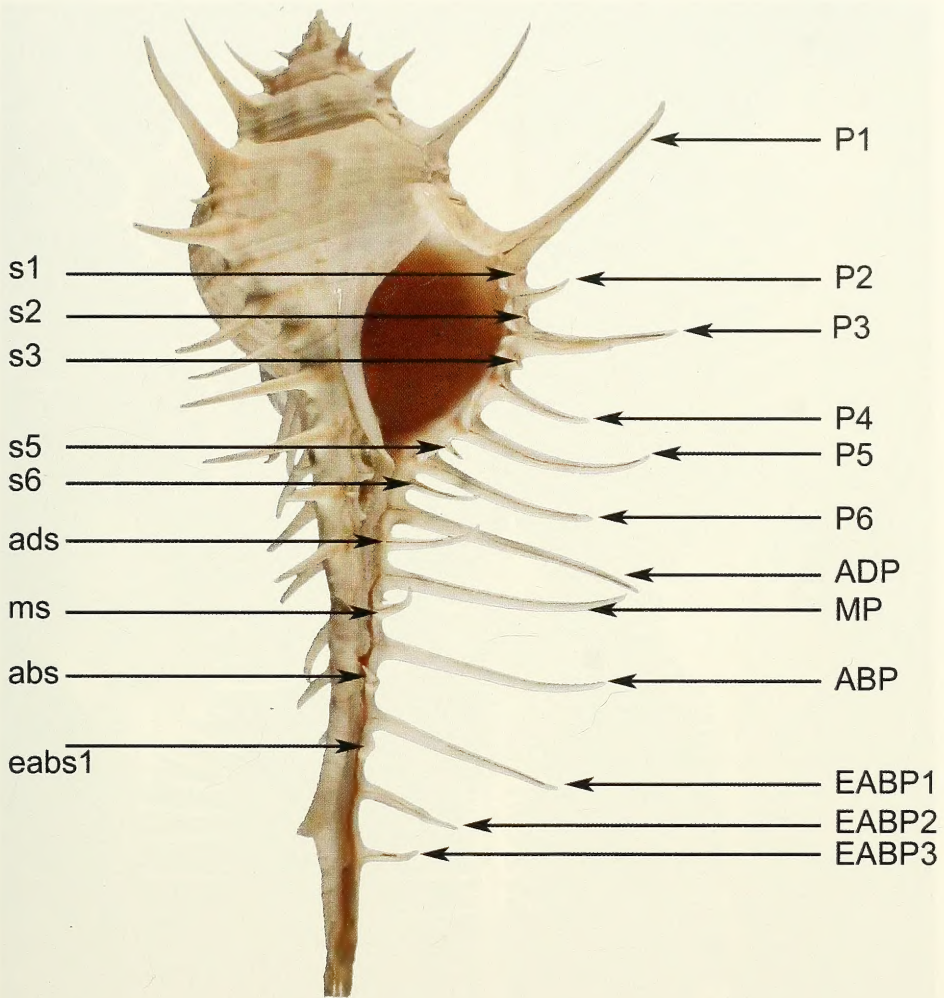


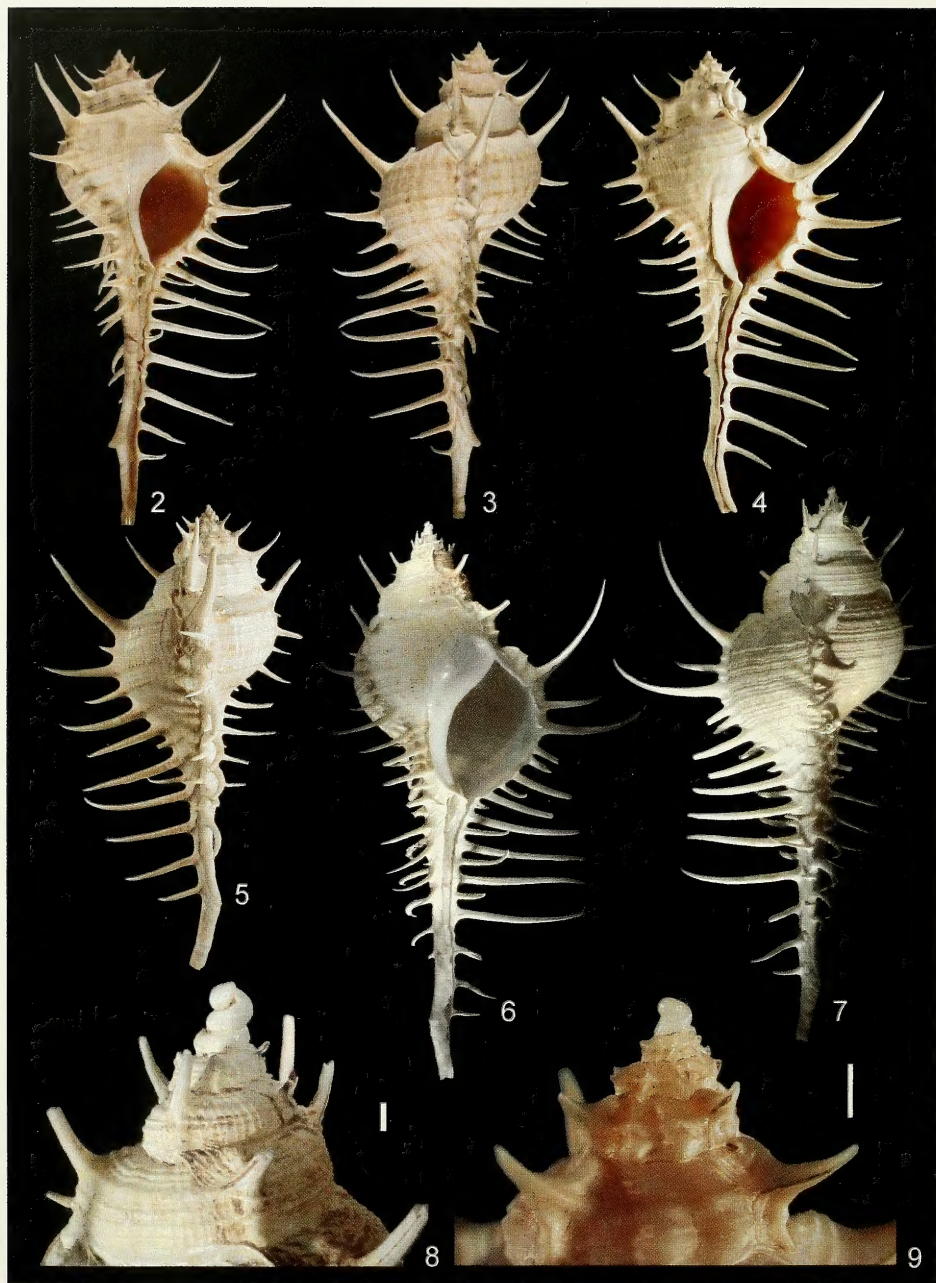
Figure 1. Terminology of spiral cord morphology in *Murex echinodes* n. sp. (holotype).

impressed. Protoconch large, whorls rounded, irregularly shaped. Last whorl weakly angular abapically. Maximum width 1600–1800 μ m. Terminal lip weakly raised and weakly curved.

Axial sculpture of teleoconch whorls consisting of low, broad, weakly rounded varices with long, acute, narrowly open primary and secondary spines. Shoulder spine longest. Other axial sculpture of low intervarical ribs and numerous growth striae. Intervarical

axial sculpture becoming weaker in strength abapically, almost disappearing on penultimate and last whorls. First teleoconch whorl with 7 axial lamellae, second whorl with 3 or 4 axial lamellae and onset of varices, third with 3 varices and 2 intervarical ribs, fourth and fifth with 3 varices and 2 or 3 intervarical ribs, sixth and last whorls with 3 varices and quite indistinct intervarical axial sculpture.

Spiral sculpture of low, narrow, smooth primary, secondary, and tertiary cords. Primary



Figures 2–9. (2–5, 9) *Murex echinodes* new species; (2, 3) Kuwait, 138.6 mm, holotype MNHN 23114; (4, 5) Kuwait, 135.7 mm, paratype coll. RH; (9) Protoconch (holotype MNHN). (6–8) *Murex megapex* Neubert, 1998, Gulf of Aden, approximately 60 nm SW of Aden, 12°16.0'N, 44°08.5'E–12°16.0'N, 44°09.5'E, 472–479 m, 170.9 mm, holotype SMF 311509/1 (photos ZMF). Scale bars, 0.5 mm.

TABLE 2. COMPARISONS OF SOME SHELL CHARACTERS.

Character	<i>M. echinodes</i>	<i>M. scolopax</i>	<i>M. somalicus</i>	<i>M. megapex</i>
Protoconch	1.6–1.75 rounded whorls. Shape irregular. Last whorl weakly angular abapically. Terminal lip weakly raised and curved (3 protoconchs examined). Broadly ovate, weakly angular.	2–2.75 strongly keeled whorls with small, flattened first whorl. Terminal lip high, broad (8 protoconchs examined). Broad, rounded, weakly angular	2.15–2.5 large, broad, irregularly sized and shaped whorls. Terminal lip straight, thin, weakly raised (6 protoconchs examined). Broad, rounded, strongly convex	3 rounded, high, large whorls with a deep suture. Terminal lip thin, erect (holotype). Broadly ovate, weakly convex.
Form of the teleoconch				
Aperture	Broad, ovate, columellar lip narrow, smooth, adherent on almost 30–35% of shell adapically, erect abapically.	Broad, ovate, columellar lip narrow, smooth, adherent on almost 30–35% of shell adapically, erect abapically.	Broad, ovate, columellar lip broad, fused with base of P5 and P6 spines of last whorl, smooth, adherent on almost 80% of shell adapically, weakly erect abapically.	Broad, ovate, columellar lip smooth, narrow, adherent on almost 30–35% of shell adapically, erect abapically.
Intervarial axial sculpture	2 or 3 low ribs from second to last teleoconch whorls.	2 or 3 low ribs from second to fourth whorl. Fifth to last whorl almost smooth.	2 or 3 very low ribs from second to fourth whorls. Other whorls smooth.	Several cords (10–12 on second whorl) which cross the granulose spiral threads from second to fourth whorl. Less apparent on fifth and last whorls.
Primary spines on the last teleoconch whorl	P1 longest spine, P2 shortest, P3 long, P4 short, P5 long, P6 weakly shorter than P5.	P1 short, P2 obsolete, P3 short, P4 shortest spine, P5 longest spine, P6 weakly shorter than P5.	P1 shortest spine, P2 obsolete, P3–P6 increasing in length abapically. P6 on siphonal canal.	P1 longest spine, P2 short, P3 long, P4 short, probably split in holotype, P5 and P6 long (tip broken).
Secondary spines on the last teleoconch whorl	Weak, almost obsolete, s6 longest.	None	None	Weak, s6 longest

spiral cords ending as long, acute spines on varices and on siphonal canal. First teleoconch whorl with visible P1 and P3; P2 first appears on second whorl, third whorl with adis, IP, P1–P3, more apparent on axial nodes; fourth and fifth whorls with adis, IP, abis, P1, s1, P2, s2, P3; sixth whorl occasionally with additional tertiary cord between P1 and s1; last whorl with t, adis, IP, abis, P1, (t), s1, P2, s2, P3, s3, P4, s4, P5, s5, P6, s6, ADP, ads, MP, ms, ABP, abs, EABP1, eabs1, EABP2, (EABP3). Secondary spines on the siphonal canal increasingly strongly bent ventrally. ADP and MP giving rise to longest spines on siphonal canal. Shoulder spine (= P1) longest spine of convex part of teleoconch whorls. P2 shortest; P4 medium sized.

Aperture broad, ovate. Columellar lip narrow, smooth, rim partially erect, adherent along nearly adapical half. Anal notch deep, broad. Outer lip weakly erect, crenulated, with strong labral tooth between P4 and P5, smooth within. Siphonal canal long, 53–56% of total shell length, narrow, straight, weakly recurved dorsally and abaxially bent at tip, narrowly open, with acute, long spines decreasing in length abapically. Operculum dark brown, ovate with subapical nucleus and 15 or 16 concentric ridges. Attached surface with broad, thick callused rim.

Radula unknown.

Remarks. *Murex echinodes* n. sp. is part of a group of large-shelled *Murex* species, all occurring in the northwestern Indian Ocean (Somalia, Gulf of Aden, Red Sea, Arabian Sea, Gulf of Oman, and Kuwait). Other species of that group are *Murex scolopax* Dillwyn, 1817 (Figs. 10–12, 19–21); *Murex somalicus* Parth, 1990 (Figs. 13–17); and *Murex megapex* Neubert, 1998 (Figs. 6–8, 40).

Murex echinodes was previously illustrated and discussed by Ponder and Vokes (1988: 49–51 [in part], fig. 84A only) but was then considered to be a form of *M. scolopax* with

a “longer more adapically directed shoulder spine” (P1) and “with a secondary spine (actually P2) usually developed between the shoulder spine and the spine below.” Additionally, the inner lip (columellar lip) “is less expanded over the parietal wall.”

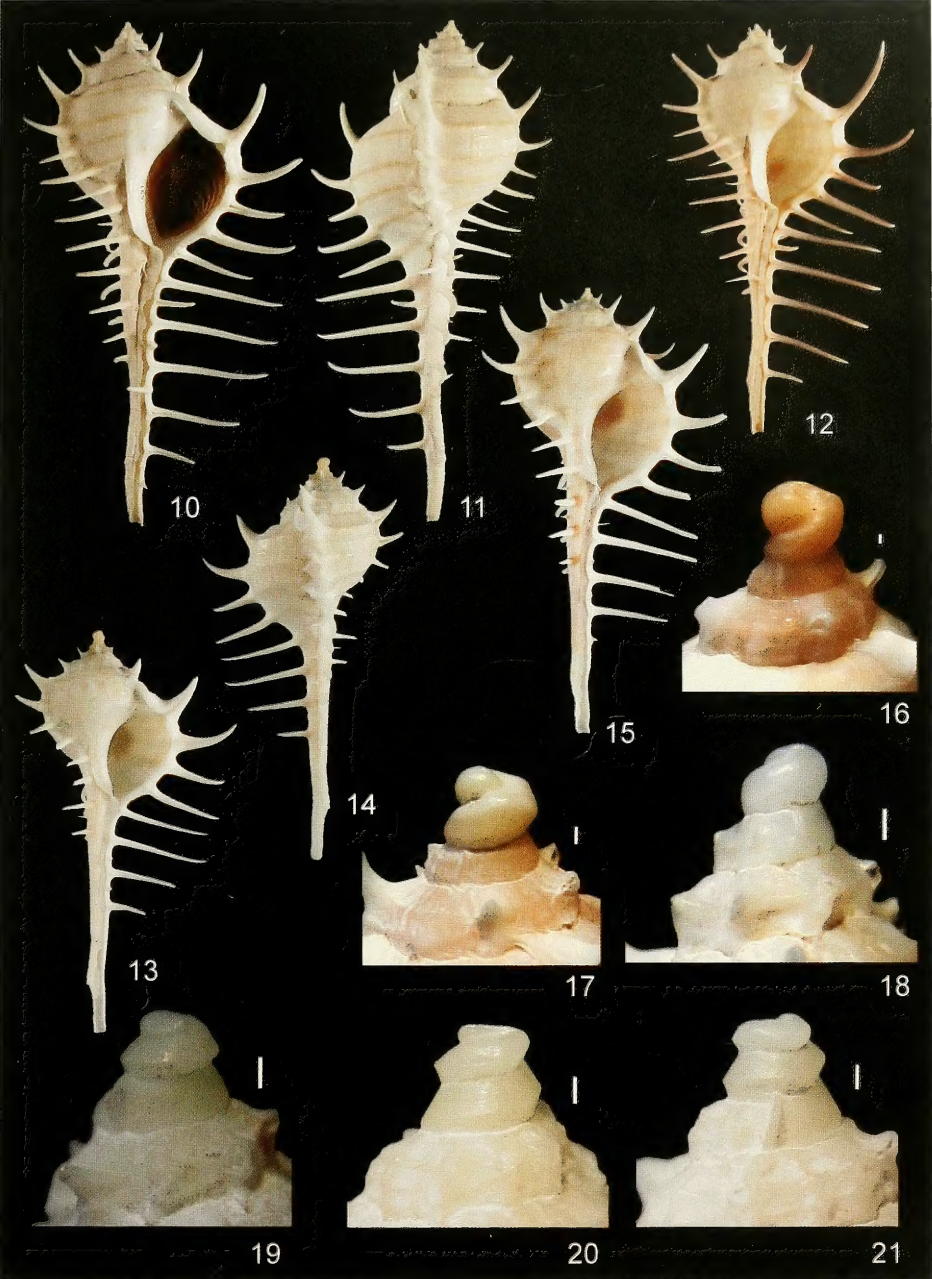
I do not fully agree with these authors when they wrote that these characters are not consistent. Some are not, but some are consistent (see below), and other characters, not cited by Ponder and Vokes (1988), are additional features that differentiate the two species.

In fact, what they cited as a “secondary spine usually developed between the shoulder spine and the spine below” is not a secondary spine, but a primary spine—more precisely, P2. In *M. scolopax*, P2 is apparent from the first teleoconch whorl, which in adult shells has visible P1, P2, and P3. P2 never reaches the strength of P1 and P3 on the abapical teleoconch whorls, but decreases in strength to be rather similar in strength and height to the secondary cords s1 and s2 on the last teleoconch whorl, or sometimes slightly stronger. In *M. echinodes* n. sp. the first teleoconch whorl and the first part of the second whorl bear only P1 and P3, P2 starting only from the end of the second teleoconch whorl. Then P2 becomes stronger and higher, almost reaching the strength of P1 and P3, with a short but obvious varical spine on the last whorl.

The first teleoconch whorls are also obviously narrower and more angular in *M. echinodes*.

In addition, although the varical spines are of similar strength on the siphonal canal in both species, those of the convex part of the teleoconch whorls are obviously longer and straighter in the new species.

Two other differences cited by Ponder and Vokes (1988) are the less expanded inner lip (columellar lip) on the parietal wall and the more rounded protoconch with fewer



Figures 10–21. (10–12) *Murex scolopax* Dillwyn, 1817; (10, 11) near Dissei Island, 2 m, Red Sea, 146.3 mm, RH; (12) Dahlak, Red Sea, 116.8 mm, RH. (13–17) *Murex somalicus* Parth, 1990, South Somalia; (13, 14) 87.3 mm; (15) 120 mm, RH; (16) South Somalia, RH; (17) South Somalia, RH. (18) Protoconch of *Murex echinodes* new species (holotype MNHN). (19–21) Protoconch of *Murex scolopax*, Near Dissei Island, 2 m, Red Sea, RH. Scale bars, 0.5 mm.

whorls. The protoconch of *M. scolopax* (Figures 19–21) is consistently larger, with 2–2.75 strongly keeled whorls, with a small, flattened first whorl and a high, broad terminal lip.

Murex echinodes also has more apparent, although weak, axial sculpture, especially on first teleoconch whorls, which is almost absent in *M. scolopax*. It is also narrower relative to its height, with a height/width ratio mean of 2.86 compared with 2.71 in *M. scolopax*.

Murex echinodes also differs in color, having brown or grayish brown flammules over the entire shell, more apparent on the spiral cords and on the dorsal side of the spines, whereas *M. scolopax* has only uniformly brown primary spiral cords and only rarely colored spines.

Murex scolopax lives in the southern part of the Red Sea and the Gulf of Aden. The shell illustrated by Coulombel (1994: 67, text fig.) as *M. scolopax* is a specimen of *M. echinodes* n. sp.; however, its presence in Djibouti is very questionable. The shell illustrated by Coulombel could have been collected outside of Djibouti.

Murex echinodes n. sp. differs from *M. somalicus* in having narrower and higher spire whorls; a more angular shell; longer, straighter, and more numerous spines; and P1 being the longest spine in *M. echinodes*, whereas it is the shortest, broad and apically curved, in *M. somalicus*. *Murex echinodes* also has a narrow columellar lip, whereas it is broadly expanded in *M. somalicus*, even fused with the last whorl spines P5 and P6. Moreover, in *M. somalicus*, P6 is situated on the siphonal canal, whereas it is situated abapically on the convex part of the whorl in *M. echinodes*, *M. scolopax*, and *M. megapex*.

Murex megapex is only known from two specimens—the holotype and one paratype—both in the Senckenberg Museum. It

has not been collected since its description. *Murex echinodes* differs consistently from *M. megapex* in having a different protoconch (Figs. 8, 9, 10), with comparatively smaller first whorls; a more angular shell; smoother, shallower, and lower spiral sculpture onset of the first teleoconch whorls (compare Figs. 8 and 9) and comparatively broader spines.

Etymology. *Echinodes* (L): prickly

Murex (Murex) indicus new species

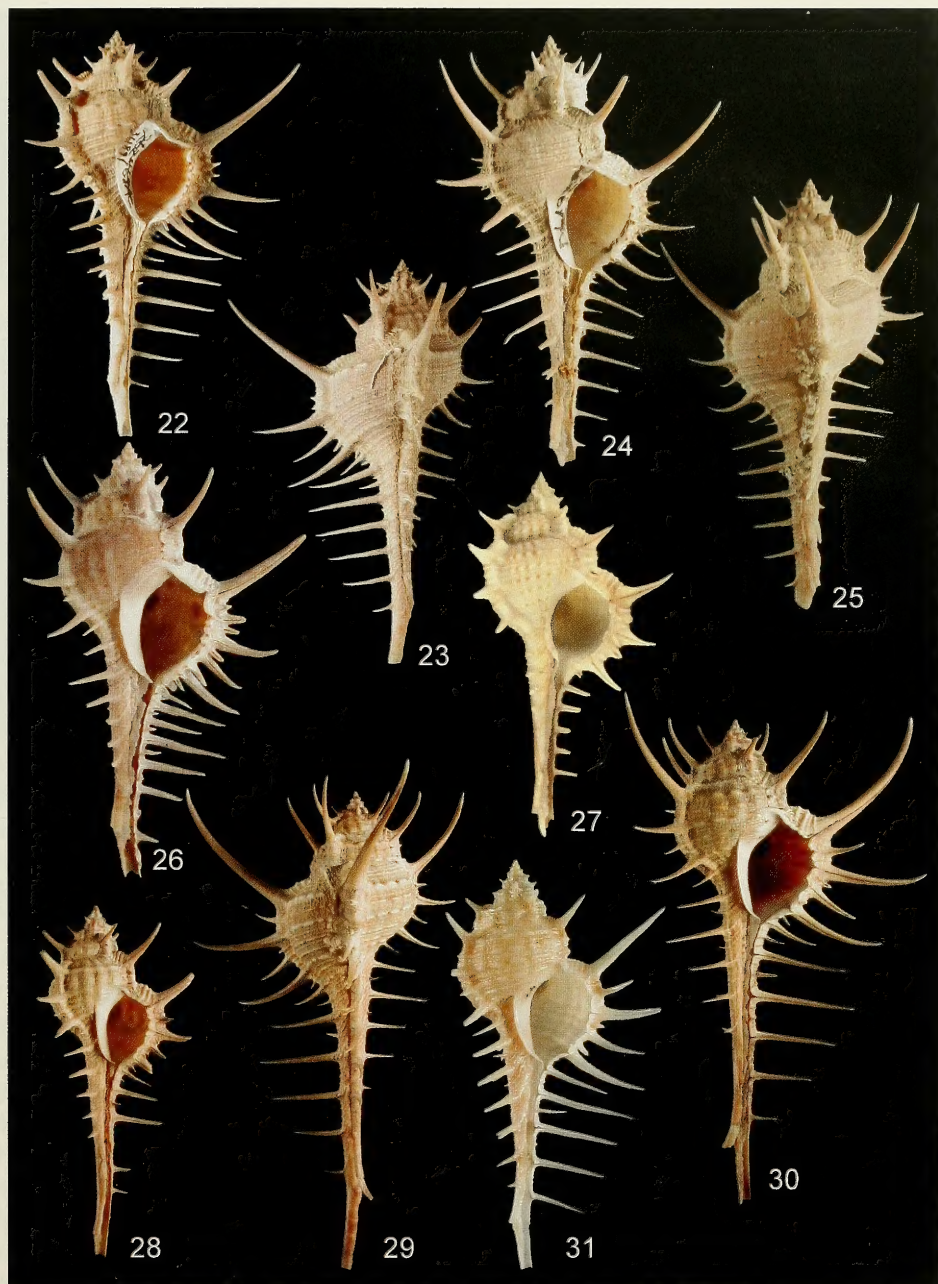
Figures 22–26, 32–34, 41; Table 3

Murex carbonnieri—Ponder and Vokes, 1988: 22 (in part), figs. 75A, B (only); Rao, 2003: 228, pl. 53, figs. 4–5 (not *Murex carbonnieri*).

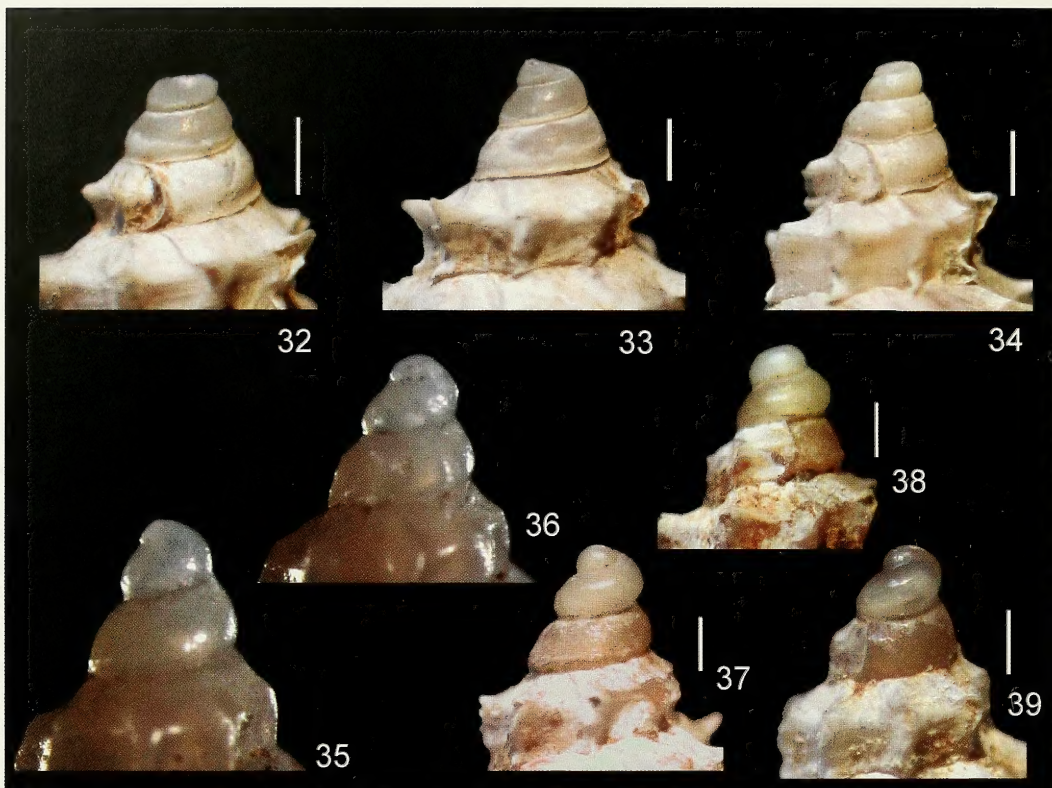
Type Material. India, Gujarat, 63 miles W of Mangrol, 21°11'N, 69°16'E, 70–71 m, Anton Brunn cruise 4B Exped., stn. 210B, 17 Nov. 1963, holotype MCZ 361891, 79.3 mm (lv); India, 78 miles SSW of Bassein, Maharashtra, 19°7'N, 71°41'E, 68–70 m, stn. 203A, 14 Nov. 1963, 1 paratype MCZ 361894 (dd); India, 44 miles SSW of Veraval, Gujarat, 20°23'N, 70°0'E, 71–79 m, stn. 206A, 15 Nov. 1963, 1 paratype MCZ 361890 (dd); India, 31 miles S of Dwarka, Gujarat, 21°49'N, 68°55'E, 50–52 m, stn. 216A, 2 paratypes MCZ 361893 (2 dd); India, 48 miles SSW of Dwarka, Gujarat, 22°3'N, 68°19'E, 79–88 m, stn. 218A, 18 Nov. 1963, 2 paratypes MCZ 361892 (lv); India, 83 miles W of Mandiv, Gujarat, 22°32'N, 68°07'E, 58 m, stn. 221A, 18 Nov. 1963, 2 paratypes MCZ 262523 (lv and dd); India, Bihar, 40 miles W of Arrah, 17°54'N, 72°27'E, 46–55 m, 1 paratype IRSNB IG 31625/MT.2305, 1 MNHN 23115, 1 coll. R. Houart (all ex MCZ 361889).

Other Material. India, 40 miles W of Arrah, 17°54'N, 72°27'E, 46–55 m, stn. 201A, MCZ 361889 (80 lv and dd juveniles); off India, by Taiwanese fishermen, 5 lv, coll. RH.

Distribution. Arabian Sea, off W–NW India, 17°54'–22°32'N, 68°07'–72°27'E, living at 46–70 m.



Figures 22–31. (22–26) *Murex indicus* new species; (22, 23) India, Gujarat, 63 miles W of Mangrol, 21°11'N, 69°16'E, 70–71 m, 79.3 mm, holotype MCZ 361891; (24, 25) India, 48 miles SSW of Dwarka, Gujarat, 22°3'N, 68°19'E, 79–88 m, 81.5 mm, paratype MCZ 361892; (26) off India, 83.8 mm, coll. RH. (27–30) *Murex carbonnieri* (Jousseaume, 1881); (27) Aden, Red Sea, 65.2 mm, lectotype MNHN (photo MNHN); (28) India, Puri, Orissa, 74.6 mm, MCZ 277715; (29, 30) Singapore, 102.3 mm, coll. RH. (31) *Murex forskoeihlii* Röding, 1798. Gulf of Suez, 79.8 mm, coll. RH.



Figures 32–39. Protoconchs and early teleoconch whorls; (32–34) *Murex indicus* new species, India, 40 miles W of Arrah, 17°54'N, 72°27'E, 46–55 m, MCZ 361889; Figures 32 and 33 figured by Ponder and Vokes (1988). (35–39) *Murex carbonnieri* (Jousseaume, 1881); (35) paralectotype MNHN, Aden, Red Sea (photo A. Robin); (36) lectotype MNHN, Aden, Red Sea (photo A. Robin); (37, 38) Singapore (Figs. 29–30); (39) Sri Lanka, coll. RH. Scale bars, 0.5 mm.

Description. Shell medium-sized for the genus, up to 92.3 mm in height at maturity (coll. RH, “India”). Height/width ratio 2.5–2.7. Broad, nodose, spinose, shoulder weakly sloping, weakly convex.

Light tan or light brown with small dark brown blotches on primary and secondary spiral cords, between axial nodes; columellar lip glossy white, inner side of outer lip white for a short distance within, with brown blotches between apertural crenulations, light brown within the aperture.

Spire high with 3+ protoconch whorls (first whorl slightly broken in all the examined

specimens). Teleoconch up to 7 broadly convex, weakly shouldered spinose and nodose whorls. Suture impressed, partially obscured by small axial lamellae of succeeding whorl. Protoconch small, conical, with a narrow weak keel abapically on penultimate and last whorls. Terminal lip thin, erect, of sinusigeral type.

Axial sculpture of narrow axial lamellae on first and second whorl and of moderately high or high varices and intervarical nodes on succeeding whorls. First and second whorl with 8 axial lamellae; third whorl with 2 or 3 axial lamellae and onset of varices with 2 or 3 intervarical nodes; fourth whorl with 3

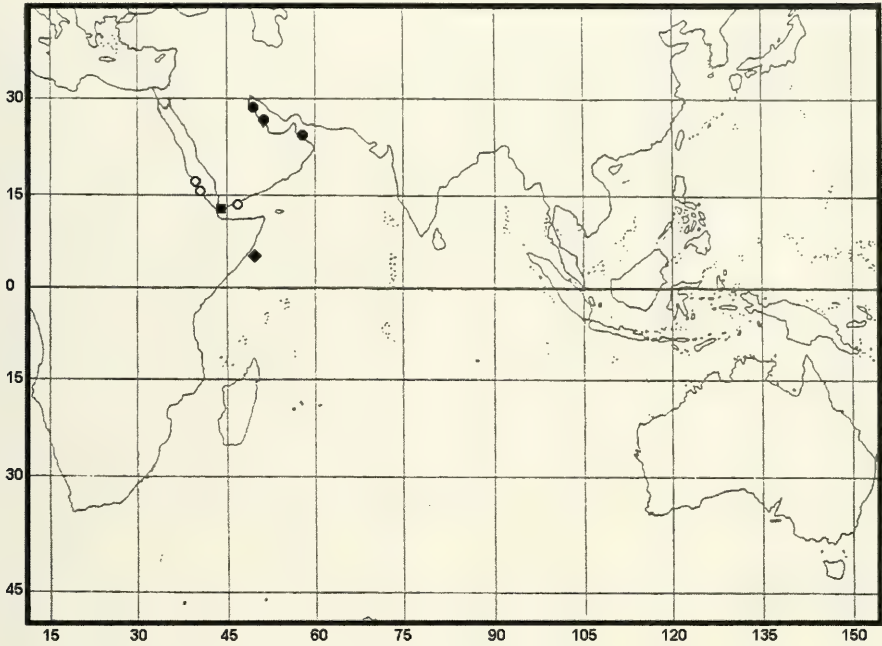


Figure 40. Distribution map of *Murex scolopax* species group: *Murex scolopax* (open circle), *M. megapex* (square), *M. somalicus* (diamond), *M. echinodes* (circle).

spinose varices and 2 high intervarical nodes; fifth whorl with 3 spinose varices and 3 or 4 low intervarical nodes or nodose ridges; sixth whorl with 3 spinose varices and 4–6 very low nodose ridges, more conspicuous on primary and secondary spiral cords; seventh whorl with 3 spinose varices and 6 very low, almost obsolete intervarical nodose ridges, obvious only on primary and occasionally on secondary spiral cords. Other axial sculpture of numerous, low growth lamellae. Spiral sculpture of low or moderately high, narrow, nodose primary, secondary, and tertiary cord and threads. First and second whorls strongly shouldered with visible P1 and P3, starting P2 on second whorl. Third whorl with visible P1, P2, and P3, starting s1; P3 occasionally obscured by succeeding whorl. Fourth whorl with adis, IP, abis, P1, t, s1, P2, s2, P3, s3, P4, s4, P5, s5, P6, s6, ABP, abs, MP, ms, ADP, ads, EABP1; P2 very narrow on first 3

teleoconch whorls, weakly stronger and broader from fourth whorl, P6 narrowest primary cord; primary cords giving rise to acute spines; P1, P3, and P5 spines longest; P4 short; P2 and P6 very short or lacking. Fifth whorl with t, adis, IP, abis, P1, t, s1, t, P2, t, s2, t, P3, t, s3, t, P4, t, s4, t, P5, t, s5, t, P6, t, s6, t, ADP, t, ads, t, MP, t, ms, t, ABP, t, abs, t, EABP1, t, eabs1, t, EABP2, eabs2, EABP3. Secondary spines giving rise to short spinelets; P2, P4, and P6 occasionally of same strength as secondary cords. Sixth and seventh whorls identical to fifth whorl, although with additional tertiary cords on subsutural ramp and between secondary cords of convex part of teleoconch whorl and of siphonal canal. Shoulder spine longest, P2 very short, P5 second longest spine, followed by P3. Spines on siphonal canal decreasing in length abapically, gradually bent ventrally. Additional spinelets

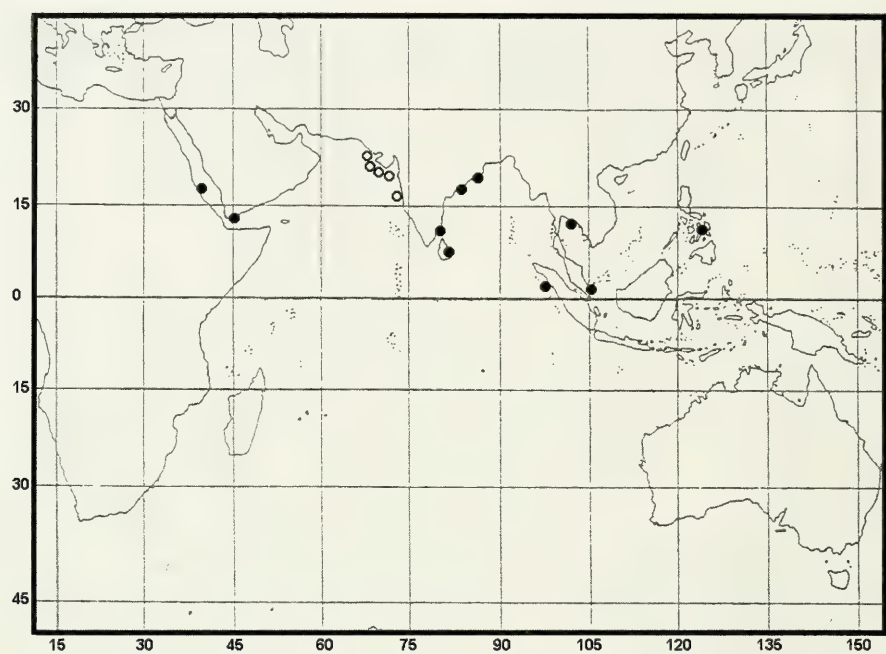


Figure 41. Distribution map of *Murex carbonnieri* and *M. indicus*: *Murex carbonnieri* (circle), *M. indicus* (open circle).

TABLE 3. COMPARISONS OF SOME SHELL CHARACTERS.

Character	<i>M. indicus</i>	<i>M. carbonnieri</i>
Protoconch	Conical with 3+ whorls with narrow, weak keel abapically, terminal lip thin, erect, of sinusigeral type (more than 30 protoconchs examined).	2.25–2.5 rounded whorls, last whorl weakly angular abapically, terminal lip thin, curved (18 protoconchs examined).
Form of the teleoconch	Broadly ovate, weakly angular.	Broadly ovate, shouldered.
Aperture	Broad, ovate, columellar lip narrow, smooth, adherent on almost 30% of shell adapically, erect abapically.	Broad, ovate, columellar lip narrow, smooth, adherent on almost 25–30% of shell adapically, erect abapically.
Intervarical axial sculpture	Onset of varices from fourth whorl with 2 intervarical nodes, fifth whorl with 3 or 4 nodes or nodose ridges, sixth whorl with 4–6 low, nodose ridges, last whorl with 6 very low nodose ridges.	Onset of varices from third whorl with 2 intervarical nodes, fifth and sixth whorls with 2–4 nodes, last whorl with 3 or 4 high, broad, nodose ridges.
Primary spines on the last teleoconch whorl	P1 longest, P2 shortest, P3 long, P4 short, P5 long, P6 short.	Same as for <i>M. indicus</i> .
Secondary spines on the last teleoconch whorl	Obvious, s1 shortest, s4 long, s6 longest. Occasional presence of tertiary spinelets.	Short or almost obsolete. s6 most obvious. No tertiary spinelets.

formed by secondary and occasionally by tertiary cords.

Aperture moderately large, ovate. Columellar lip narrow, smooth, rim partially erect, adherent at adapical extremity. Anal notch deep, broad. Outer lip weakly erect, crenulated with weak, broad labral tooth between P4 and P5. Siphonal canal long, 52–57% of total shell length, straight, with low growth lamellae over entire length, weakly bent abaxially at abapical extremity, narrowly open; broad and tapered adapically.

Operculum not observed; all live-taken specimens have dried animal deep inside the shell.

Radula and animal unknown.

Remarks. The protoconch of *Murex indicus* n. sp. had already been illustrated in part by Ponder and Vokes (1988: fig. 75A, B), who figured the protoconch of a specimen housed in MCZ (361889, ex 262074) as *M. carbonnieri* (Jousseaume, 1881) (here, Figs. 32–34).

Murex indicus differs from *M. carbonnieri* in having a conical, multispiral protoconch with a sinusigeral notch, denoting planktotrophic larval development, in contrast to the protoconch of the typical *M. carbonnieri*, which denotes non-planktotrophic larval development and having fewer, more irregular and abapically angular last whorls. The terminal lip of *M. carbonnieri* is not of sinusigeral type but is weakly convex and rather high (Fig. 36–39), as also seen in Ponder and Vokes (fig. 75C).

Other differences in *M. indicus* are the thicker apertural varix, the more numerous tertiary cords, the more numerous varical spinelets originating from the secondary and tertiary cords, and the more numerous and more close-set spines on the siphonal canal.

Murex indicus n. sp. also resembles *M. forskoehlili* Röding, 1798, from the Red Sea and invasive in the eastern Mediterranean. However, *M. forskoehlili* is very close to *M. carbonnieri*, with almost identical protoconch

whorls, similar sculpture morphology of the teleoconch whorls, and the same color pattern with brown spots, mainly on the primary spiral cords. Both forms could be conspecific, although the protoconch whorls seem to be consistently larger and less angular in *M. forskoehlili*. Ponder and Vokes (1988: 33) already pointed out the close relationship between both species. *Murex indicus* n. sp. differs from *M. forskoehlili* in having the same shell character differences as with *M. carbonnieri*.

Etymology. *Indicus* (L): from India.

Note. Ponder and Vokes (1988) examined hundreds of specimens housed in dozens of Museums to complete their revision. Research at the same scale to determine the complete geographical distribution of the species included in the present study was an impossible task. However, it is interesting to have an idea on their current distribution.

Because it is quite impossible to identify specimens correctly with lists only, the distribution maps are based on the type material and on specimens housed in my reference collection only. They cover partially, but at a large scale, the distribution maps published by Ponder and Vokes (1988: figs 13, 25).

ACKNOWLEDGMENTS

I am most grateful to Adam Baldinger, Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts, for the loan of specimens and the gift of paratypes; to Thierry Backeljau, Institut royal des Sciences naturelles de Belgique, for his continuous help and useful collaboration; to Virginie Héros, Muséum national d'Histoire naturelle, Paris, for the digital photograph of the holotype of *Murex carbonnieri*; to Ronald Janssen, Senckenberg Museum, Frankfurt, for the digital photographs of the holotype of *Murex megapex*; to Alain Robin, Le Mesnil St. Denis, France, for the digital photographs of

the protoconch of the holotype of *Murex carbonnieri*; to Dave Rolfe, Northfleet, United Kingdom, for the loan of additional species of *Murex echinodes* n. sp.; and to John Wolff, Lancaster, Pennsylvania, U.S.A, for checking the English text. Finally, I am very thankful to the two referees, M. G. (Jerry) Harasewych and Winston Ponder, for their useful comments.

LITERATURE CITED

- BOSCH, D., AND E. BOSCH. 1982. Seashells of Oman. Essex, England, Longman Group Ltd.
- , AND ———. 1989. Seashells of Southern Arabia. Dubai, U.A.E., Motivate Publishing.
- BOSCH, D. T., S. P. DANCE, R. G. MOOLENBEEK, AND P. G. OLIVER. 1995. Seashells of Eastern Arabia. P. Dance (ed.). Dubai, U.A.E., Motivate Publishing.
- COULOMBEL, A. 1994. Coquillages de Djibouti. Aix-en-Provence, France, Edisud, La Calade.
- HOUART, R. 2010a. Description of a new species from Indonesia in the *Murex scolopax* group (Mollusca: Gastropoda: Muricidae) and comments about *Murex (Murex) ternispina* Lamarck, 1822 from East Java. *Novapex* 11(1): 29–35.
- . 2010b. Description of a new species of *Murex* s.s. (Gastropoda: Muricidae) from Taiwan. *The Venus* (in press).
- , AND B. DHARMA. 2001. Description of *Murex (Murex) hystricosus* n. sp. (Gastropoda, Muricidae) from Sumatra, Indian Ocean. *Novapex* 2(2): 31–36.
- MERLE, D. 1999. La radiation des Muricidae (Gastropoda : Neogastropoda) au Paléogène: approche phylogénétique et évolutive. Unpublished thesis. Paris, Muséum national d'Histoire naturelle.
- . 2001. The spiral cords and the internal denticles of the outer lip in the Muricidae: terminology and methodological comments. *Novapex* 2(3): 69–91.
- . 2005. The spiral cords of the Muricidae (Gastropoda, Neogastropoda): importance of ontogenetic and topological correspondences for delineating structural homologies. *Lethaia* 38: 367–379.
- , AND R. HOUART. 2003. Ontogenetic changes of the spiral cords as keys innovation of the muricid sculptural patterns: the example of the *Muricopsis-Murexsul* lineages (Gastropoda: Muricidae: Muricopsinae). *Compte Rendu Palevol* 2: 547–561.
- PONDER, W. F., AND E. H. VOKES. 1988. Revision of the Indo-West Pacific fossil and Recent species of *Murex* s.s. and *Haustellum* (Mollusca: Gastropoda: Muricidae). Records of the Australian Museum 8(suppl.): 1–160.
- RAO, N. V. S. 2003. Indian seashells (Part 1): Polyplacophora and Gastropoda. Kolkata, India, Records of the Zoological Survey of India Occasional Paper 192.
- ROBIN, A. 2008. Encyclopedia of Marine Gastropods. AFC-Xenophora, Paris, France and Conchbooks, Hackenheim, Germany.

